Tools for Landscape Habitat Planning and Cumulative Impact Assessment
Work by Interior Timberland Planning (ITP), updated August 2004

1. Building the Connection Between Habitat Elements and Multiple Species of Wildlife – CWHR Modeling

The California Wildlife Habitat Relationships system includes habitat suitability models for over 600 terrestrial vertebrates.

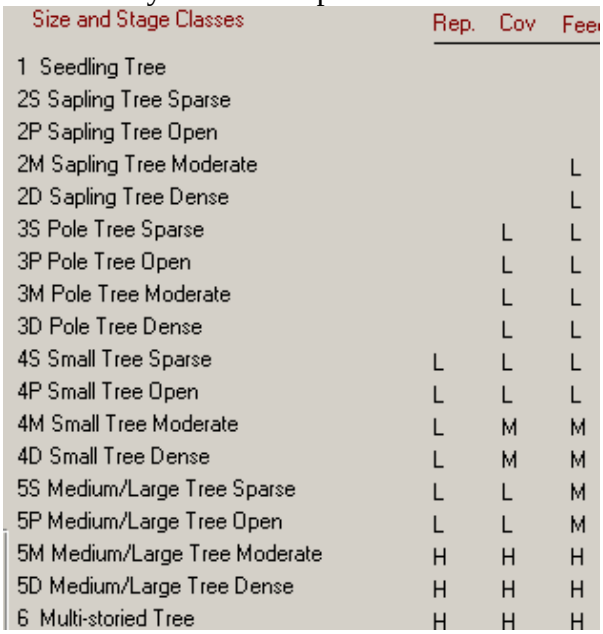
CWHR forest habitats:

Aspen	Montane Hardwood
Blue Oak Foothill Pine	Montane Riparian
Blue Oak Woodland	Pinyon-Juniper
Coastal Oak Woodland	Ponderosa Pine
Closed-Cone Pine-Cypress	Redwood
Douglas Fir	Red Fir
Eastside Pine	Subalpine Conifer
Jeffrey Pine	Sierran Mixed Conifer
Juniper	Valley Oak Woodland
Klamath Mixed Conifer	Valley Foothill Riparian
Lodgepole Pine	White Fir
Montane Hardwood-Conifer	

CWHR Size and Cover Classes:

Size Class	Stand QMD (in.)	Canopy Cover Class	Percent Cover
1	< 1	S	10 – 25
2	1 – 6	P	25 – 40
3	6 – 11	M	40 – 60
4	11 – 24	D	60 – 100
5	24 +		
6	Class 5 over 4 or 3		

Example CWHR habitat suitability model for spotted owl in Klamath mixed conifer:



Size and Stage Classes	Rep.	Cov	Fee
1 Seedling Tree			
2S Sapling Tree Sparse			
2P Sapling Tree Open			
2M Sapling Tree Moderate			L
2D Sapling Tree Dense			L
3S Pole Tree Sparse		L	L
3P Pole Tree Open		L	L
3M Pole Tree Moderate		L	L
3D Pole Tree Dense		L	L
4S Small Tree Sparse	L	L	L
4P Small Tree Open	L	L	L
4M Small Tree Moderate	L	M	M
4D Small Tree Dense	L	M	M
5S Medium/Large Tree Sparse	L	L	M
5P Medium/Large Tree Open	L	L	M
5M Medium/Large Tree Moderate	H	H	H
5D Medium/Large Tree Dense	H	H	H
6 Multi-storied Tree	H	H	H

Guild software developed by ITP (and based on CWHR) has helped us to link wildlife species to similar habitats and habitat elements.

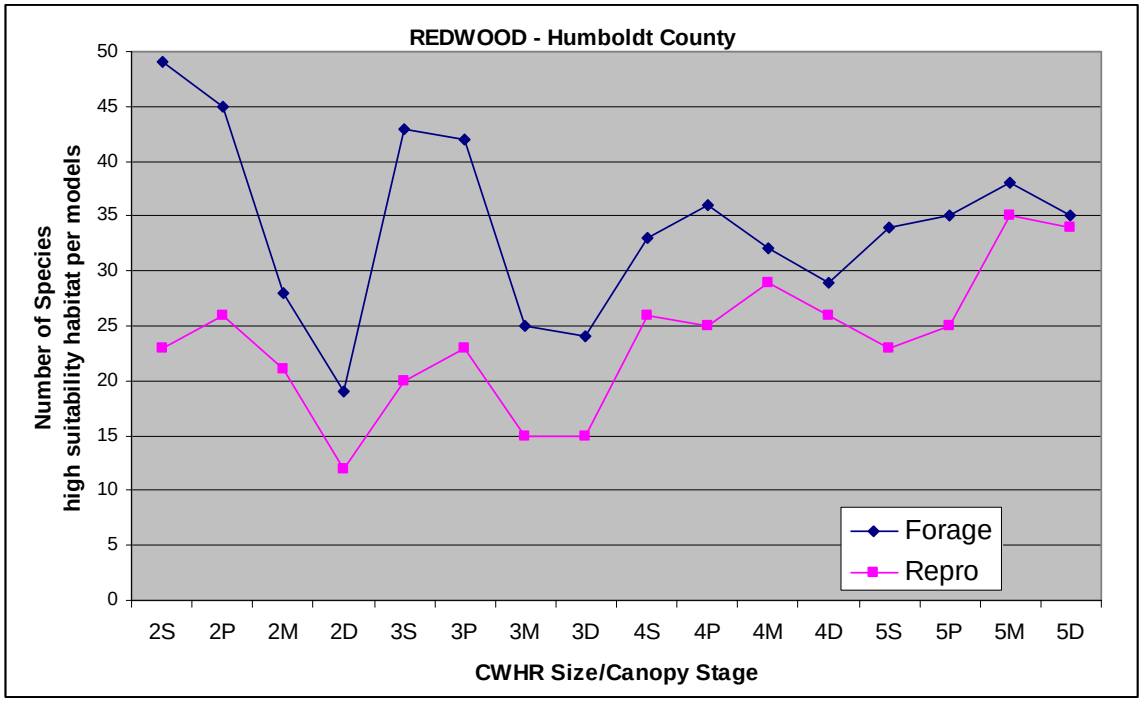
Terrestrial vertebrates strongly associated with **early seral** habitats or habitat elements (e.g., herbaceous plants and shrubs) for Trinity County conifer forests:

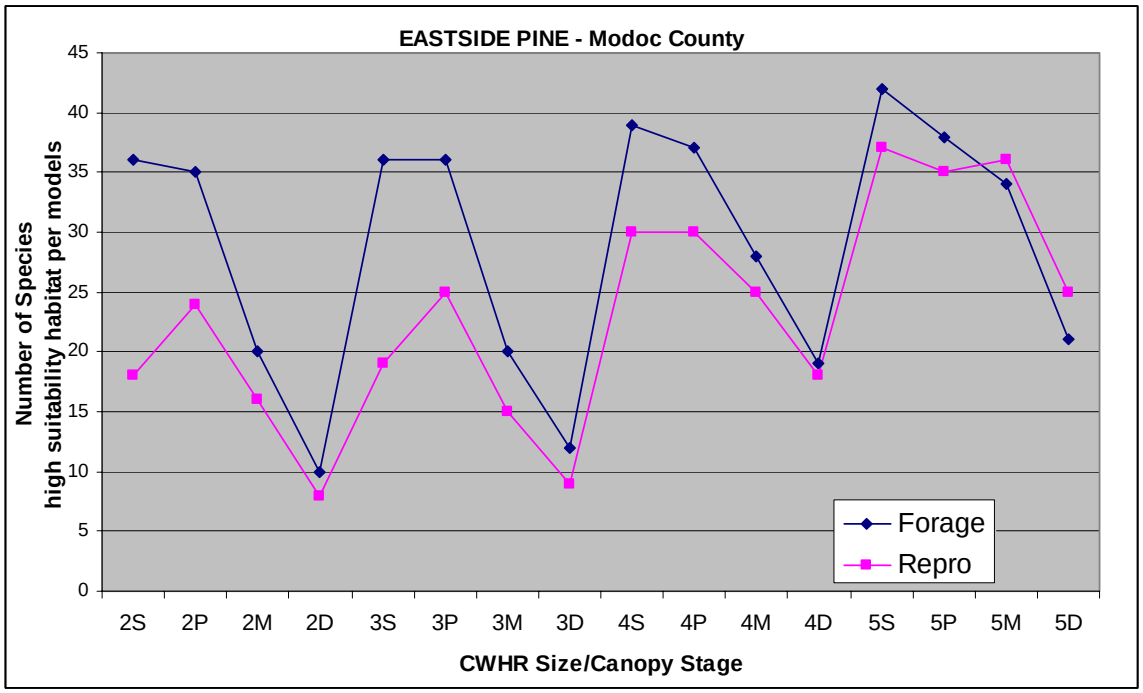
Birds		**Mammals**
American Kestrel	Mountain Bluebird	Black Bear
American Robin	Mountain Quail	Brush Mouse
Barn Owl	Nashville Warbler	Brush Rabbit
Blue Grouse	Northern Saw-Whet Owl	Common Porcupine
Calliope Hummingbird	Pacific-Slope Flycatcher	Creeping Vole
Cassin's Finch	Peregrine Falcon	Dusky-Footed Woodrat
Chipping Sparrow	Prairie Falcon	Elk
Common Nighthawk	Red-Tailed Hawk	Ermine
Dark-Eyed Junco	Ruby-Crowned Kinglet	Gray Fox
Dusky Flycatcher	Ruffed Grouse	Mountain Beaver
Fox Sparrow	Rufous Hummingbird	Mountain Lion
Golden Eagle	Steller's Jay	Mule Deer
Great Horned Owl	Winter Wren	Shrew-Mole
Green-Tailed Towhee	Yellow Warbler	Striped Skunk
Hermit Thrush	Yellow-Rumped Warbler	Trowbridge's Shrew

Terrestrial vertebrates strongly associated with **late seral** habitats or habitat elements (e.g., large diameter, structurally decadent live trees and snags) for Trinity County conifer forests:

Birds		**Mammals**
American Kestrel	Northern Pygmy Owl	Bobcat
Band-Tailed Pigeon	Northern Saw-Whet Owl	Douglas' Squirrel
Barred Owl	Olive-Sided Flycatcher	Ermine
Blue Grouse	Osprey	Fisher
Brown Creeper	Pileated Woodpecker	Long-Legged Myotis
Evening Grosbeak	Purple Finch	Long-Tailed Weasel
Flammulated Owl	Pygmy Nuthatch	Northern Flying Squirrel
Golden-Crowned Kinglet	Red Crossbill	Raccoon
Gray Jay	Red-Breasted Nuthatch	Ruffed Grouse
Great Horned Owl	Red-Breasted Sapsucker	Silver-Haired Bat
Hairy Woodpecker	Spotted Owl	Striped Skunk
Hammond's Flycatcher	Turkey Vulture	Western Spotted Skunk
Hermit Warbler	Violet-Green Swallow	
Lewis' Woodpecker	Western Tanager	**Reptiles**
Mountain Bluebird	Western Wood-Pewee	Rubber Boa
Mountain Chickadee	White-Breasted Nuthatch	
Northern Flicker	White-Headed Woodpecker	
Northern Goshawk	Williamson's Sapsucker	
Northern Pygmy Owl	Winter Wren	

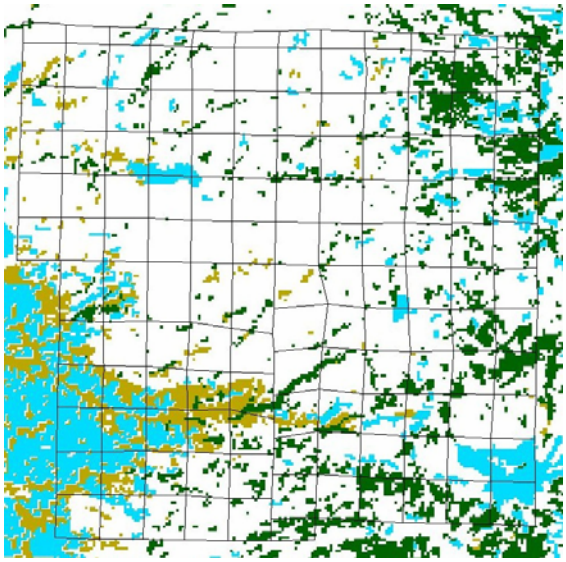
Additional software also based on CWHR has been useful for describing how biodiversity varies with forest type and structural condition:



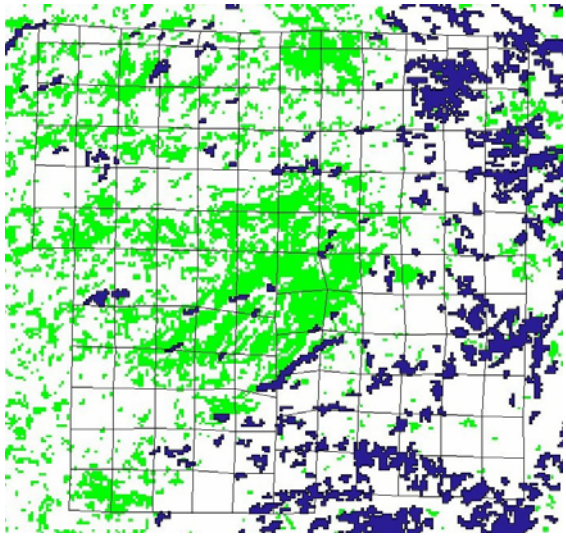


2. Measuring Landscape Habitat Conditions with Remote-Sensed Imagery

Below is a picture of 1997 imagery from the Fire and Resource Assessments Program's "LCMMP" LANDSAT-derived layer. It has been modified by ITP to serve as proxies for habitat elements (e.g., early seral, late seral, hardwoods, edge) of critical importance to multiple species of wildlife.



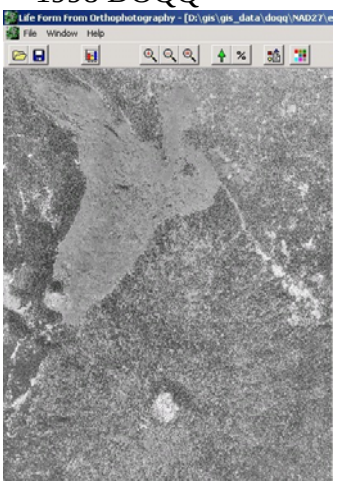
Dark green - Large trees
Light brown – Hardwoods
Blue - Non-forested areas > 10 acres



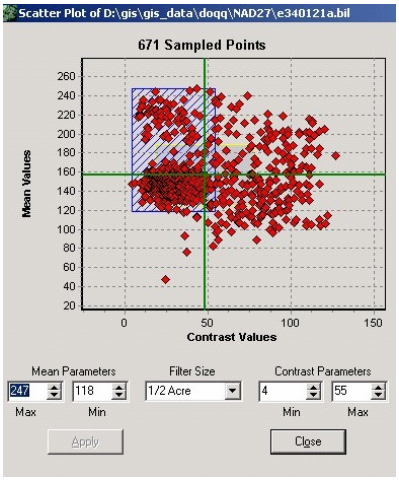
Green - Forested areas < 40% canopy cover.
Blue - Areas >10 ac. w/ large trees & canopy >40 %.

We are also using image classification software developed by Forest Service researcher Jim Laacke to convert black and white aerial photographs (e.g., DOQQs) into habitat maps.

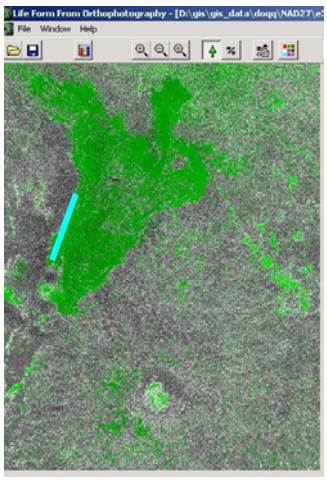
1998 DOQQ



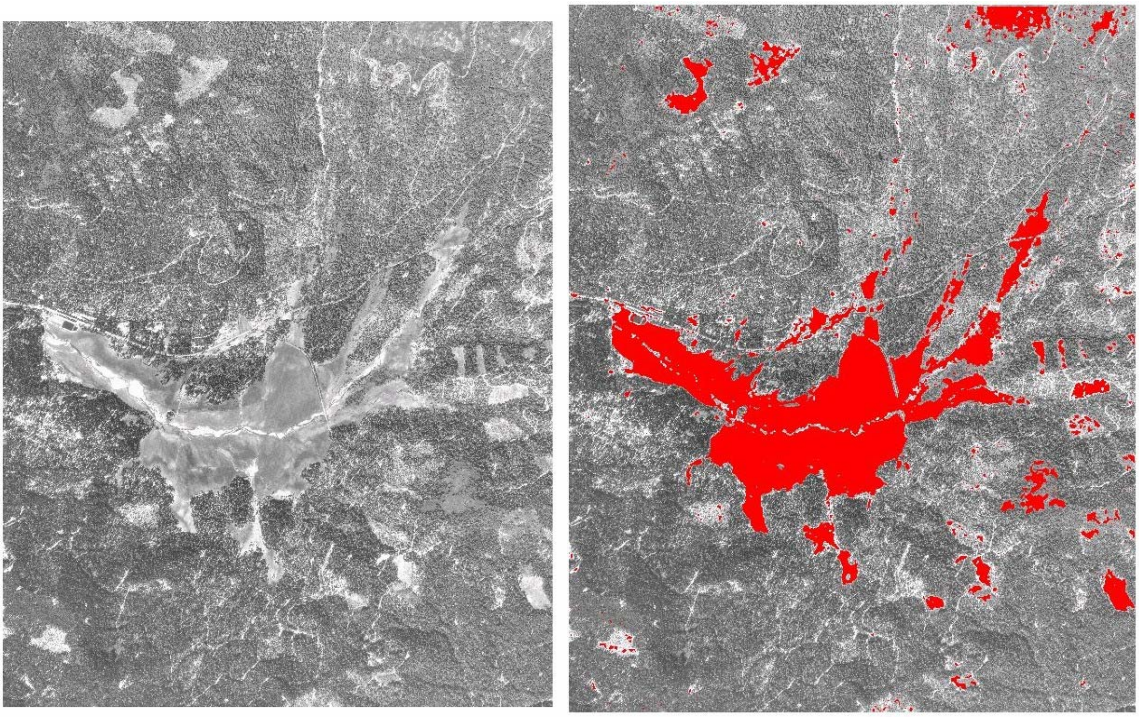
Lifeform Software



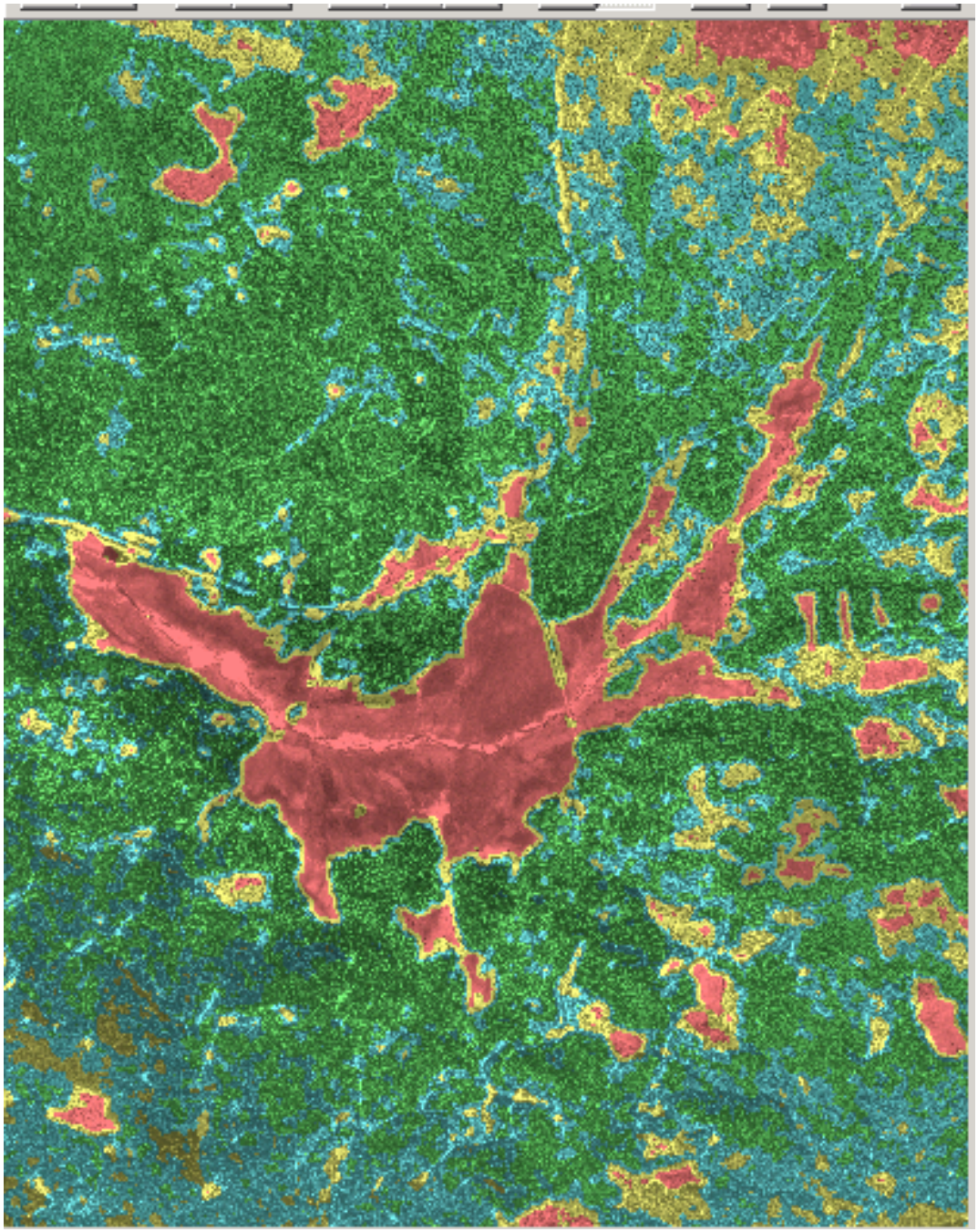
Herbaceous/shrub habitats



In the 1998 DOQQ, below, red represents areas dominated by non-tree vegetation. As demonstrated by the open area in the southwest corner that is not in red, we are still working through some of technical details of this approach.

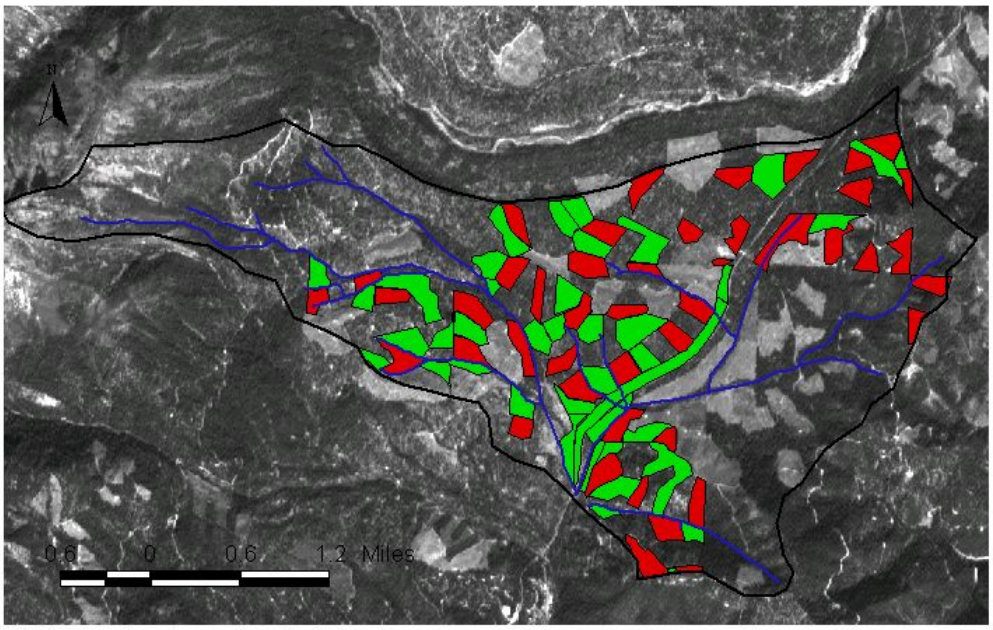


We are using another Laacke program to map forest canopy cover. In the 1998 DOQQ, below, red represents areas with less than 10 percent tree cover, yellow represents 10 – 40 percent canopy cover, blue represents 40 – 60 percent cover, and green represents greater than 60 percent cover.



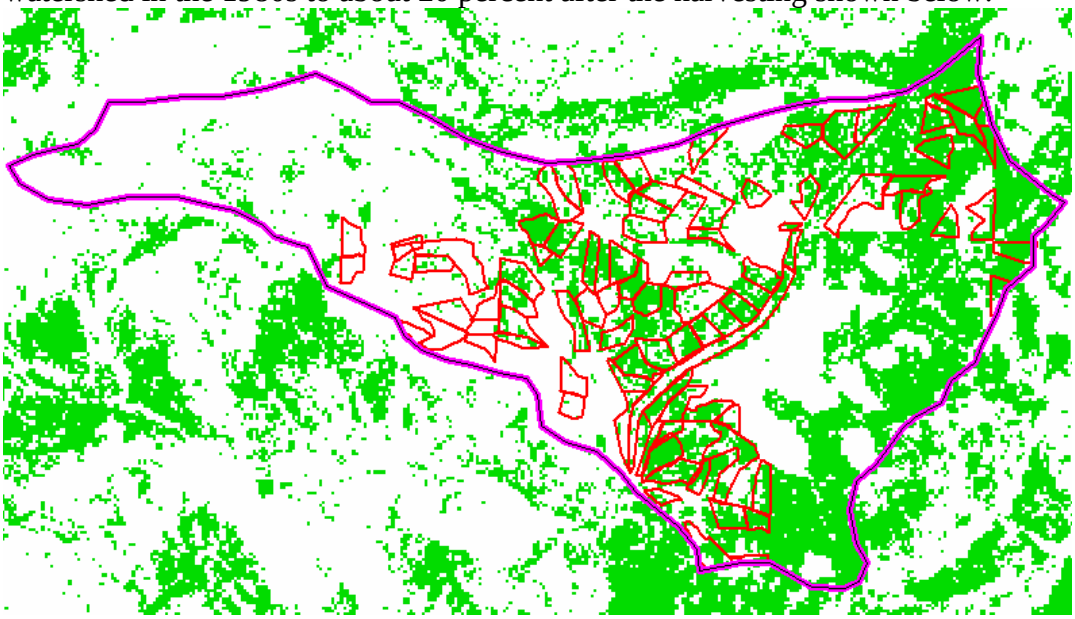
3. Tracking Cumulative Timber Harvesting Effects and Modeling Impacts

Cumative Impacts of Past and Future Timber Harvesting
in the Davis Creek Planning Watershed (near Trinity Center)

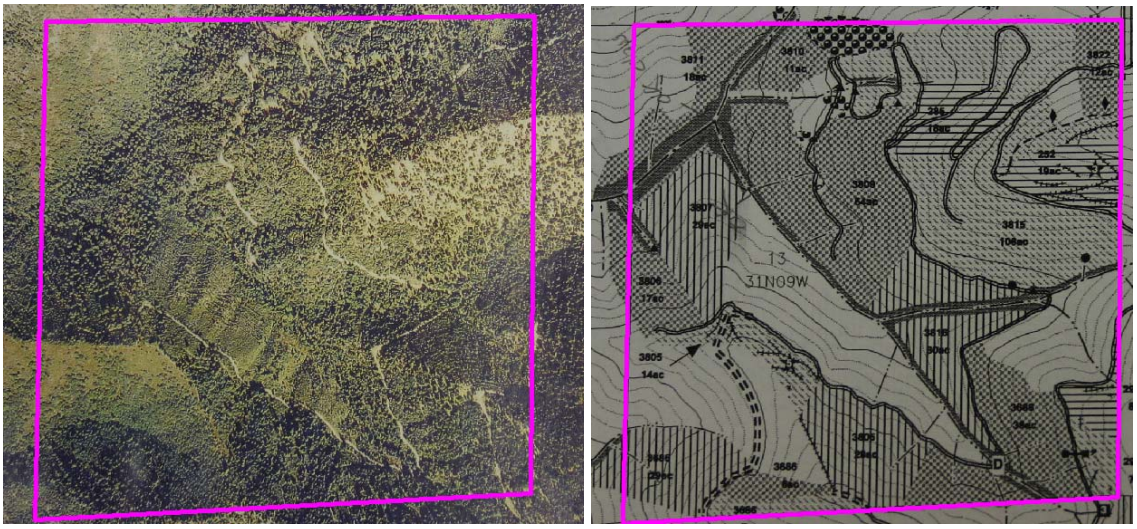


6,200-acre planning watershed
Past harvesting shown by 1998 SPOT satellite photography
Future clearcuts (red) and thinning units (green) for 4 timber harvesting plans (1998-2001)
18 miles (340 acres) of streams and riparian buffers (blue)

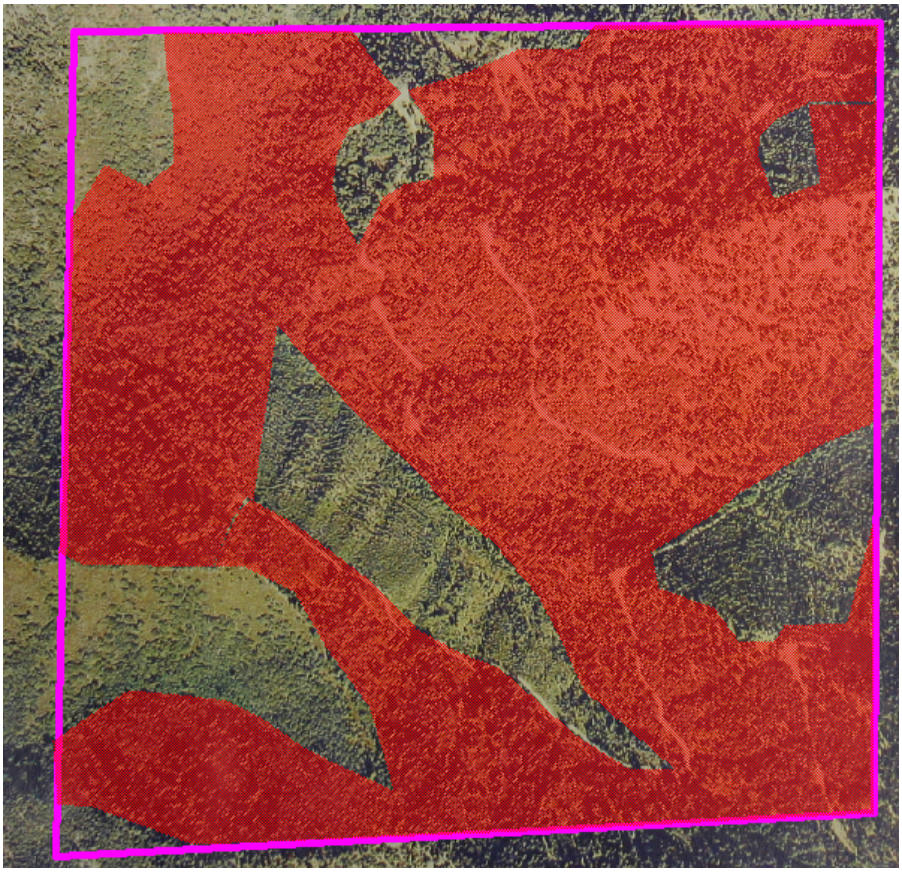
Baseline conditions for large tree habitat elements were modeling using 1994 "Fox" Landsat imagery. In this case, the coverage of large tree habitat elements (e.g., trees >24 inches dbh with structural decadence) was modeled to decrease from 50 percent of the watershed in the 1980s to about 20 percent after the harvesting shown below.



Geo-rectification of color aerial photographs and timber harvesting plan maps:

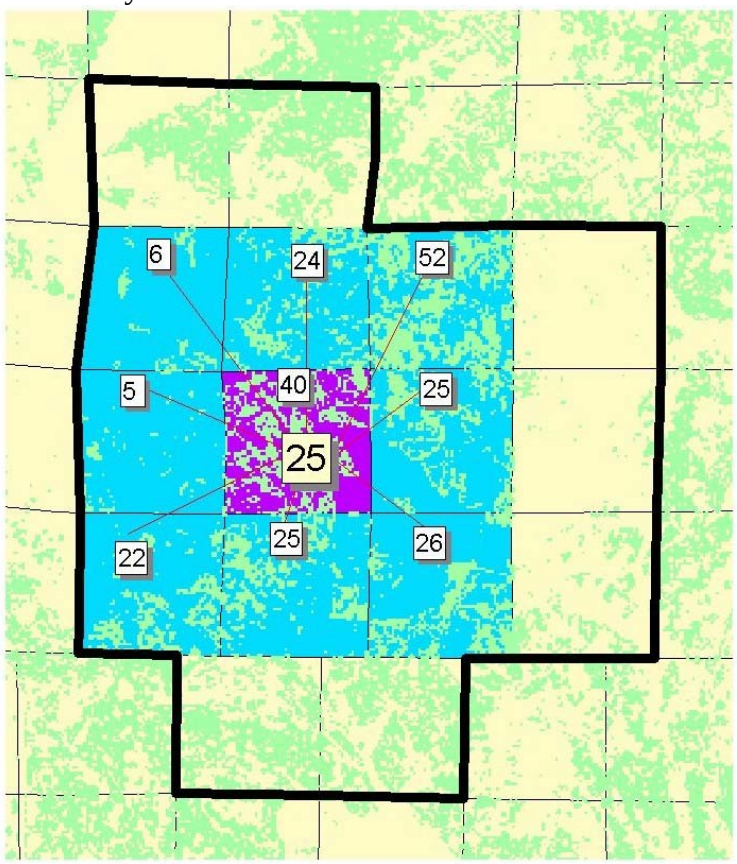


Modeling effects of clearcutting and shelterwood removal step harvest on the large tree component:

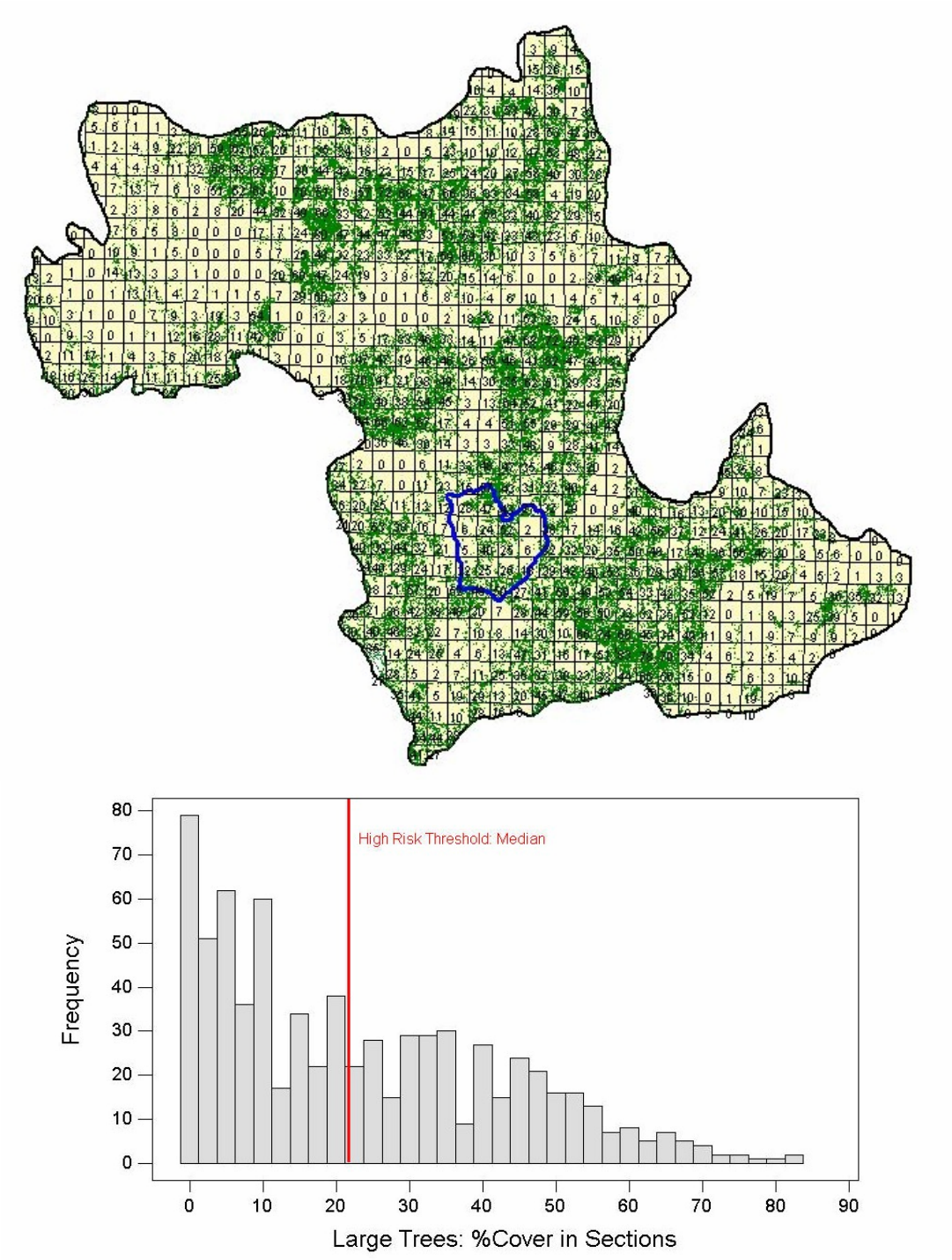


4. Tools for Identifying Cumulative Impact Thresholds

We are exploring options for cumulative impact assessment methodologies. In the example below, each square mile section has a "cell" value denoting the percent cover for a habitat feature in the section, and a "window" value representing the average cell value for the section and nearby sections.



Cumulative impact risk thresholds for these window values could be selected based on biological importance (e.g., guild modeling) and percentile analysis of current conditions on the surrounding landscape. The example below shows the mapping of large trees as a habitat element within a USDA sub-ecoregion. A hypothetical risk threshold based on the median cell value is demonstrated. Cumulative impacts and the risk of significant adverse impacts could then be assessed at the scale of a planning watershed such as the one delineated in blue.



A finer-grained approach could consider distances to nearby habitat features and minimum patch size constraints. In the example below, a habitat feature is mapped on the left in green. The color map on the left transforms the habitat map into the acres of habitat in clumps larger than two acres that are within one mile of a place.